

REMARKS

Claims 1-27 are pending in this application, stand rejected and are at issue herein. Reconsideration of claims 1-27 in view of the following remarks and indication of their allowability at an early date are respectfully solicited.

The applicants wish to thank the Examiner for recognition of the priority of this application.

The Examiner has objected to the drawings under 37 CFR 1.83(a) as failing to show every feature of the invention specified in the claims. Specifically, the Examiner has indicated that the power modules, battery chargers, plurality of battery channels coupled and parallel, the presence detector, the series coupling, etc. are not shown in the drawings. However, the applicant respectfully submits that these features are shown in the drawings as originally filed, and are, therefore, perplexed by such objection.

Specifically, the power modules are illustrated in, for example, FIG. 1, as element 24. Similarly, the battery charger is also shown in this FIG. 1 as element 23 as are the battery packs 22. The plurality of battery channels coupled and parallel is also illustrated in this FIG. 1 as described in the originally filed specification, paragraph [0051]. The presence detector, as described in the originally filed specification in paragraph [0062] and in paragraph [0065], may be in the controller 43 by, for example, the use of a module send input 92_{a-c} illustrated, for example, in FIG. 12. Finally, the series connection of the batteries is also shown in FIG. 12 designated as battery center tap and is described in the originally filed specification in paragraph [0006], [0007], [0015], [0021] and [0023].

In view of the above, the applicants respectfully submit that the drawings do show every feature of the invention specified in the claims in accordance with 37 CFR 1.83(a). Reconsideration of this ground of objection and indication of the acceptability of the originally filed drawings are therefore respectfully solicited.

The Examiner has also objected to the specification as failing to provide proper antecedent basis for the claimed subject matter "first nominal value", "first predetermined amount", "second nominal value", "third nominal value", etc. The applicants are also perplexed with regard to this ground of objection. Specifically, neither 37 CFR 1.75(d)(1)

nor MPEP §608.01(o) require that ordinal designators within the claims must be specifically included in the specification. That is, while conventional claiming practice requires that different "nominal values" be designated differently for clarity of the claims by using, for example, ordinal indicators first, second, third, etc., there is no requirement that the description contained in the specification use such identical ordinal indicators.

The specification does provide a discussion of the use of nominal values and predetermined amounts which, in the context in which they are used in the specification, clearly describe the invention in accordance with 35 USC §112. Specifically, the specification describes the various nominal values used in the system of the present invention in, for example, paragraphs [0015], [0016], [0017], [0018], [0019], [0020], [0067], [0068] and [0069]. Similarly, the specification also describes the various predetermined amounts in, for example, paragraphs [0015], [0016], [0017], [0018], [0019], [0020], [0021], [0022], and [0068].

The applicants respectfully submit that there is no requirement that the ordinal indicators that are required by conventional claiming practice in the claims are also required in the written description of the specification. Therefore, the applicants respectfully submit that the specification is in proper form and provides proper antecedent basis for the claimed subject matter as required by 37 CFR 1.75(d)(1) and MPEP §608.01(o). Reconsideration of this ground of objection and acceptance of the specification as originally filed are respectfully solicited.

The Examiner has rejected claims 1-14 and 22-27 under 37 CFR §103(a) as being unpatenable over Reeves et al., U.S. Patent No. 6,020,743, in view of Finger, U.S. Patent No. 4,460,870. The applicants have thoroughly examined each of these references and the Examiner's combination thereof in view of claims 1-14 and 22-27, but must respectfully traverse this ground of rejection. Reconsideration of this ground of rejection and indication of the allowability of claims 1-14 and 22-27 in view of the following remarks are respectfully solicited.

The Examiner initially addresses claims 22-27, and so the applicants will address these claims first in this response.

Initially, the Examiner indicates that the recitation "battery packs, power modules, or battery chargers" is confusing due to the use of the term "or". However, such a statement is inappropriate in a rejection of the claims under 35 USC §103(a). Further, the quoted terminology cited by the Examiner is contained in the preamble of the claim, and is clear when taken in context. Specifically, the language cited by the Examiner reads "the UPS system having a plurality of parallel connected slots into which may be coupled the battery packs, power modules, or battery chargers as determined and configured by a user..." When this language is taken in context in view of the system described in the originally filed specification, the applicants respectfully submit that this language is clear and perfectly in accord with 35 USC §112. This is particularly so when it is considered that this language is contained in the preamble of the claim to provide a context or intended use of the invention as claimed in the body of the claim.

Additionally, the Examiner has stated that the limitation "the voltage sense selector circuit" was interpreted in light of the specification which describes that it comprises "a shift register sequentially generating a number of output enable signals in response to the clock input and the slot select input from the controller." While the applicants do not deny that one embodiment of the voltage sense selector circuit is described in such a manner in the specification, to the extent that the Examiner has limited the claimed voltage sense selector circuit to the preferred embodiment described in the specification, such limitation is improper. Indeed, it is axiomatic in the patent law that it is inappropriate to read limitations into the claims from the specification. This prohibition may be particularly significant in this case in view of the Examiner's use of bold font type for the term "sequentially" which appears nowhere in claim 22. Indeed, claim 26 specifies details of one embodiment, which it appears the Examiner is reading into claim 22. As such, the applicants must respectfully submit that if the Examiner has limited the claim term "the voltage sense selector circuit" to cover only "a shift register sequentially generating a number of output enable signals in response to the clock input and the slot select input from the controller", such a limited interpretation is improper, and the applicants do not acquiesce to such a limited interpretation of this claim term.

In applying the references to claims 22-27, the Examiner has indicated that Reeves et al. supplies the teaching of all of the elements of claim 22 except for the voltage sense selector circuit, which teaching is provided by the Finger reference. However, claim 22 requires that the voltage sense circuit be coupled to each series coupling of each slot and be

operable to generate "a voltage sense signal" in response to a voltage present thereon, and that the controller compare "the voltage sense signal" for the particular slot to "a predetermined expected value" and identify an operational status of the battery based thereon.

Reeves, however, does not utilize a single voltage sense signal compared to a predetermined expected value for that signal to determine the operational status of the batteries. Instead, Reeves utilizes three separate voltage measurements to calculate a comparative ratio to determine the operational status of the battery pack. Specifically, Reeves describes that this comparative ratio analysis requires the measurement of the voltage across each of the two portions of the battery cell stack and the voltage across the entire battery cell stack. Reeves describes that such a comparative ratio analysis is required to avoid "the errors caused by measuring float voltage" as may occur in other types of battery monitoring systems. Reeves, et al, '743, column 3, lines 13-15. That is, "by employing a ratio comparative analysis of voltage drops across the cells of a battery irrespective of the float voltage concurrently provided across the terminals of the battery" allows the system of Reeves to detect the failed batteries without removing them from the circuit.

The system of Reeves models the battery as a series of resistors each having an equal voltage drop when a float charge is applied. Using such a model Reeves describes that such equal voltage drops "enable a comparative ratio analysis of the difference between the voltage drops across two half stacks of the batteries cells to the voltage across the entire battery." *Id* at lines 50-54.

Unlike the system of the present invention claimed in claim 22 that compares the voltage sense signal in response to a voltage present at the series coupling of the battery to a predetermined expected value to determine the operational status of the battery packs, the system of Reeves utilizes a voltage measuring device that "separately measures voltages across the first portion, the second portion, and a combination of the two portions." *Id* at lines 65-column 4, line 1. Instead of determining the operational status of the battery based on this single voltage sense signal as compared with a predetermined expected value, the system of Reeves determines "whether a battery has failed based upon the voltage measured across the first portion, the voltage measured across the second portion, and the voltage measured across a combination of the two portions." *Id* at column 4, lines 3-6.

The applicants were unable to find any description in Reeves that would allow for a determination of the operational status of a battery pack by taking a single voltage reading and comparing it to an expected predetermined value.

In view of the fact that the system of Reeves requires that three separate voltage readings be taken and that a comparative ratio be calculated in order to determine the operational status of the battery pack, the applicants respectfully submit that Reeves does not teach that the controller compare the voltage sense signal in response to a voltage present at the series coupling between the battery packs to determine the operational status based thereon as indicated by the Examiner. As such, this combination of references does not teach or suggest each and every limitation of independent claim 22. Indeed, the Reeves reference specifically requires that three separate voltage measurements be taken and that a comparative ratio of these three values be calculated to determine the operational status of the battery. As such, Reeves does not merely not teach or suggest the limitations of this claim, but specifically requires a completely different system necessitating the measurement of three different levels and the calculation of a comparative ratio to determine this operational status. This is a system much more complex than that of independent claim 22.

In addition to the requirement that each and every element of the claimed invention be taught or suggested by the combination of references, a *prima facie* case of obviousness also requires that there be a suggestion or motivation to combine the teachings of the references. To support the combination of the Finger reference with Reeves, the Examiner states that the suggestion or motivation is "to detect successive time sample intervals of the battery." However, the applicant can see no reason why one of ordinary skill in the art would be motivated by such a purpose to include a shift register as taught by Finger in the circuit for detecting failed batteries taught by Reeves.

Specifically, the current circuit of Reeves takes three voltage measurements across a battery pack and calculates a comparative ratio of the three voltage signals while the battery is receiving a float charge to determine the operational status of the battery pack. The system of Finger, however, is directed at determining a state of charge during a quiescent interval "with substantially no current flow through the battery" by determining the quiescent time interval since the last substantial current flow through the battery, taking rapid measurement of the battery terminal voltage, and relating the combination of these two measurements to known battery open circuit voltage recovery characteristics. There is no such similar

requirement in the system of Reeves, and, in fact, the system of Reeves specifically requires that the float voltage be received by the battery pack during the period of measurement of the three different voltage signals there across.

Instead of measuring a voltage across a first portion, a second portion and a combination of the two portions in calculating a comparative ratio to determine battery operational status during the period that the battery receives a float voltage, the system of Finger requires that a battery terminal voltage be measured at a quiescent condition with substantially no current flow through the battery. These two requirements are mutually exclusive. The shift register 80 is used to detect the presence of successive time sample intervals during this quiescent state. By taking the measurement at the battery terminal voltage upon the completion of the time intervals an indication of the battery charge condition can be determined. This timing and detection of the expiration of timing intervals is required in the system of Finger because the recovery of the battery terminal voltage upon the discontinuation of substantial load, and the initiation of quiescence, follows a very predictable exponential characteristic as a function of time after an initial brief interval during which the recovery of the terminal voltage of the battery is substantially dependent upon the amplitude of the prior current through the battery. The samples of terminal voltage in accordance with the system of Finger are thus taken after the prior-current amplitude-dependent range in the voltage recovery, and in that range which is substantially independent of the prior current amplitude. Since the recovery of voltage in that second range is then an exponential function of time, taking the voltage sample at a fixed and predetermined interval after the beginning of quiescence, and in the range which is independent of prior current amplitude, provides a basis for predicting the ultimate steady state quiescent open circuit voltage, and thus providing a measurement of battery charge condition which is almost as accurate as the ultimate steady state open circuit voltage might be. See Finger, column 8, line 58-column 9, line 11. This is a purpose completely foreign to the system of Reeves, and therefore the applicants respectfully submit that no one of ordinary skill in the art would be motivated to use such a shift register for any purpose with the circuit of Reeves.

In view of the above, the applicants respectfully submit that independent claim 22 is not obvious in view of Reeves and Finger, taken alone or in combination. The applicants also respectfully submit that claims 23-27, which depend ultimately from claim 22, also cannot be obvious in view of these references taken alone or in combination for the reasons stated above.

Dependent claim 23 requires that the controller read the voltage sense signal for each slot in which battery packs are installed, calculates an average voltage value, and compares the voltage sense signal for each slot to the average voltage value to identify the operational status of the battery packs for each slot. Such a teaching is completely foreign to the comparative ratio analysis performed by Reeves.

First, it is noted that this comparative ratio is used to determine the operational status of a single battery pack comprising two series connected twelve cell batteries. The applicants were unable to find, and the Examiner failed to identify, a single discussion in Reeves that would relate any of the voltage information taken from the single battery pack to other voltage information taken from other battery packs installed in other slots in an uninterruptible power supply. That is, the teachings of Reeves are confined to the determination of the operational status of a single battery pack comprising two twelve cell batteries connected in series.

Claim 23, however, calculates an average voltage for all of the installed battery packs in the UPS, and then determines the operational status of each individual battery pack by comparing its voltage sense signal to the average for all of the battery packs installed. Reeves wholly fails to teach or suggest any such system. Therefore, the applicants respectfully submit that claim 23 is also not obvious for this additional reason. Further, the applicants respectfully submit that claims 24 and 25, each of which depend from claim 23, are also patentable for this additional reason.

Dependent claim 24 additionally requires, *inter alia*, the identification of which of two battery packs are failed based upon the voltage sense signal taken at the series coupling in comparison to an expected voltage value at that same point during a float charge condition. While it is true that the system of Reeves requires that the measurements be taken during a float charge, there is no description or suggestion in Reeves that a determination of which of the two twelve cell batteries are failed based upon a comparison of the voltage signal taken at the series connection is greater or less than an expected value. Instead, all three voltage measurements are used to calculate a comparative ratio to determine the operational status of the battery. However, while Reeves recognizes that the battery includes two portions connected in series, the system and method of Reeves only detects the operational status of the overall battery, and fails to identify which of the two portions connected to the series are

failed. As such, the applicants respectfully submit that claim 24 is patentable for this additional reason.

Claim 25 requires, *inter alia*, that the controller read the voltage sense signal during a discharge mode. However, such a monitoring condition is specifically precluded by the disclosure of Reeves which, instead, requires that the monitoring be conducted during a period of receiving a float charge. Specifically, Reeves at column 3, lines 29-38 describes that monitoring the battery voltage during slow rate battery charge minimizes voltage imbalances between cells whereas these differences tend to be magnified during discharge. As such, the system of Reeves specifically requires that the voltage monitoring take place during the receipt of a float voltage, and not during a discharge mode. Therefore, the applicants respectfully submit that claim 25 is patentable for this additional reason.

Turning now to the method claims, the Examiner has failed to identify where in either reference the step of comparing the voltage to the first nominal value for the midpoint voltage during the quiescent state of operation of the battery packs is taught or suggested in either cited reference. The applicants respectfully submit that this is because neither reference teaches such a step. Instead, Reeves requires that three voltage measurements be taken and a comparative ratio be calculated. It is this comparative ratio that is compared to a threshold value to determine whether or not the battery pack has failed. That is, while the method of independent claim 1 can determine the lack of operational readiness of both battery packs by monitoring a single voltage at a midpoint between the two battery packs during a quiescent state of operation and comparing that voltage to a nominal value for the midpoint voltage during the quiescent state of operation, the system of Reeves requires that three separate voltage measurements be taken, one across the first portion of the battery pack, one across the second portion of the battery pack, and a third across both battery packs, a comparative ratio be calculated based on these three voltage measurements, and that ratio be compared to a threshold value to determine the operational status. The method of independent claim 1 accomplishes the same goal of determining the operational readiness by taking two less voltage measurements and without calculating a ratio between three measurements. As such, the applicants respectfully submit that independent claim 1 is not obvious in view of Reeves and Finger taken alone or in combination. Further, the applicants respectfully submit that claims 2-14 which depend on independent claim 1 are also patentable for the same reason.

With regard to method claims 2-13, the Examiner merely points to the remarks and references for independent claim 1. The applicants respectfully submit that this is not a proper rejection as each of claims 2-13 include additional or further definition of the method of claim 1. As such, the applicants respectfully submit that the Examiner has wholly failed to establish a *prima facie* case of obviousness against claims 2-13. Removal of this ground of rejection and indication of the allowability for these claims are therefore respectfully solicited.

Additionally, claim 2 requires the calculation of the first nominal value as an average of the voltages monitored for each parallel couple battery channel. As discussed above, neither Reeves nor Finger teach that multiple battery channels may be monitored, and that the operational status of any one channel may be based upon a comparison of that channels voltage compared to an average of all channels.

Claims 4 and 5 include the step of indicating a lack of operational readiness of a first one of the two battery packs and a second one of the two battery packs, respectively. As discussed above, neither Reeves nor Finger provide any mechanism to determine the operational status of one of the pair of series connected batteries in the battery channel. Claims 6 requires, *inter alia*, the step of calculating the second nominal value for the midpoint voltage during the float charging of the battery packs as the average of the voltages monitored for each parallel coupled battery channel. As discussed above, neither Reeves nor Finger teach or suggest such a parallel coupled battery channel.

Dependent claims 7 and 8 (as amended to reflect the proper dependency on claim 6) includes steps to determine the operational readiness of a first and a second one of the two battery packs of that battery channel, respectively. As discussed above, neither Reeves nor Finger provide any method of distinguishing which of the two battery packs or portions of the battery are failed.

Claims 9-12 require, *inter alia*, the monitoring of the voltage at a midpoint between the two battery packs at a state of discharge of the battery packs. However, Reeves specifically teaches against such monitoring because small voltage differences between cells in a battery "tend to be magnified during discharge". As such, the system and method of Reeves is confined to monitoring of the battery voltage while the battery receives a float

voltage. Therefore, the applicants respectfully submit that Reeves teaches against the method of claims 9-12. Therefore, Reeves cannot be used to reject these claims.

The Examiner has rejected claims 12-21 under 35 USC §103(a) as being unpatentable over Reeves and Finger and in view of PK Electronics. The applicants were unable to confirm that the PK Electronics reference has been considered by the Examiner, despite its application herein, because there appears to be no listing of this reference signed by the Examiner. Such an indication is respectfully solicited.

Claims 12-14 each require that the step of monitoring a voltage for each of the parallel coupled battery channels at a midpoint between the two battery packs take place during a state of discharge. However, as discussed above, such monitoring is specifically taught against by the system of Reeves which describes that the small voltage differences between cells are magnified during the discharge, and therefore the system of Reeves performs its voltage monitoring only during a period when the batteries are receiving a float voltage. As such, the applicants respectfully submit that the method of claims 12-14 cannot be rendered obvious in view of this specific teaching against. Reconsideration of claims 12-14 for this reason are therefore respectfully solicited.

Further, claims 13 and 14 each require the step of indicating a lack of operational readiness of a first and a second one of the two battery packs, respectively. As discussed above, neither Reeves nor Finger teach the ability to distinguish which of the two battery portions forming the battery are failed. The Examiner has also failed to indicate any teaching or suggestion in the PK Electronics reference that would allow for such distinguishing the failed portion of the battery.

Independent claim 15, requires, *inter alia*, the step of calculating an average midpoint voltage for all slots having battery packs installed therein and comparing the voltage for each slot to the average midpoint voltage for all slots. However, none of the cited references taken alone or in combination teach or suggest the calculation of an average midpoint voltage and the comparison of each individual midpoint voltage to that average midpoint voltage to detect and identify a failed battery pack in an uninterruptible power supply. While the system of Reeves requires three separate voltage measurements be taken, the average is never calculated. Instead, a comparative ratio is calculated for the battery and compared to a threshold level to determine the operational readiness of that individual battery.

Claim 18 requires, *inter alia*, a determination that the battery packs are operating in a quiescent mode. However, while the system of Finger requires that the batteries be monitored during a quiescent interval, the system of Reeves specifically teaches against monitoring the battery during such a mode of operation. Specifically, Reeves in column 3, lines 10-15 states that there has been a need for battery testing method and apparatus that measures battery voltage "while on-line" to determine whether the battery has failed and "avoids the need to take the battery off-line..." Instead, the system of Reeves specifically requires that the batteries be receiving a float voltage when the measurements be taken. As such, it cannot be said that the combination of these references would have been obvious to one of ordinary skill in the art.

Claim 19 requires, *inter alia*, the step of identifying a first one of the two battery packs and a second one of the two battery packs as failed depending on when the voltage for its associated slot is less than or greater than a predetermined value, respectively. As indicated above, the Examiner has failed to cite any support in any of the cited references to distinguish which of the portions of the battery are failed.

Claim 20 requires that the battery packs be operating in a discharging mode. However, as discussed above, monitoring of the battery voltage during such a discharge is specifically precluded by the teachings of Reeves. Similarly, Finger also teaches against monitoring of the voltage during a discharge by specifically requiring that the charge be determined for a battery during a quiescent interval "with substantially no current flow through the battery."

In view of the above, the applicants respectfully submit that claims 12-21 are also patentable over the cited references.

In addition to the above, with regard to claims 2, 6, 7 and 8, the Examiner has admitted on the record in paragraph 7 of the Office Action that "Reeves and Finger do not disclose a plurality of battery channels coupled and parallel with one another." However, each of these claims recite a plurality of battery channels coupled and parallel. This would appear to preclude the rejection of these claims as set forth in this Office Action in view of the Examiner's own admission that the combination of Reeves and Finger fail to teach the

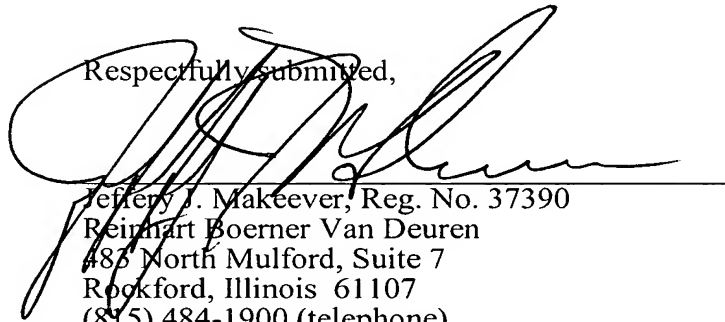
In re Appln. Of: David Layden et al.
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plurality of battery channels coupled and parallel. Reconsideration of these claims in view of the Examiner's admission are also respectfully solicited.

In view of the above the applicants respectfully submit that claims 1-27 are in condition for allowance. Reconsideration of claims 1-27, the specification and drawings, and indication of the allowability thereof in view of the foregoing remarks are respectfully solicited.

If the Examiner believes that a telephonic conversation will aid in the resolution of any issues not resolved herein, the Examiner is invited to contact the applicants attorney at the telephone number listed below.

Respectfully submitted,



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